

**REMARKS**

Claims 1-8 and 10-18 are pending in the present application, and are rejected. Claims 1-8 and 10 are herein canceled. Claim 11 is herein amended. No new matter has been entered.

**Claim Rejections under 35 U.S.C. §103(a)**

Claims 1, 7-8, 10-11, and 17-18 are rejected under 35 U.S.C. §103(a) as unpatentable over Kohno et al. (US 6,130,006) view of Noda et al. (US 5,527,639). The Examiner asserts that Kohno et al. disclose a nickel-hydrogen secondary battery according to the aforementioned aspects, but admits that Kohno et al. do not disclose the specific additional element/compound of positive electrode, including the nickel hydroxide and Nb.

**As to claims 1, 8 and 11**

The Examiner notes that Noda et al. disclose a galvanic cell (TITLE/ABSTRACT) such as nickel-hydrogen cell (COL 5, lines 4-6) wherein the positive electrode active material includes  $\text{Nb}_2\text{O}_5$ , and/or  $\text{WO}_3$  (COL 5, lines 16-32). The Examiner concludes that it would have been obvious to use the specific additional element/compound of positive electrode of Noda et al. in the positive electrode of Kohno et al. because it is taught in Noda et al. that positive electrodes having such specific additional elements are excellent in utilization factor of nickel hydroxide under atmosphere ranging from an ordinary temperature to a high temperature.

Claims 1, 7-8, 10-11, and 17-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kohno et al. view of Fleisher et al. (US 2002/0122980). The Examiner concludes that it would have been obvious to use the specific additional element/compound of positive electrode of

Fleisher et al. in the positive electrode of Kohno et al. because Fleisher et al. disclose that it is known to make cathode comprising one or more of the abovementioned compounds for the purposes of increasing capacity and open circuit voltage, and electrochemical stability.

Claims 1, 7-8, 10-11, and 17-18 are rejected under 35 U.S.C. §103(a) as unpatentable over Kohno et al. view of Imoto et al. (US 2003/0096166). The Examiner concludes that it would have been obvious to use the specific additional element/compound of positive electrode of Imoto et al. in the positive electrode of Kohno et al. as Imoto et al. disclose that the incorporation of the foregoing additional element/compound in the positive electrode makes it possible to lower the rate at which the cobalt compound in the nickel hydroxide active material is dissolved and precipitated in the electrolytic solution.

Claims 1, 7, 8, 10, 11, 17 and 18 are rejected under 35 U.S.C. §103(a) as unpatentable over Kohno et al. (US 6,130,006) view of Sato et al. (US 2004/0234865).

The Examiner concludes that it would have been obvious to use the specific additional element/compound of positive electrode of Sato et al. in the positive electrode of Kohno et al. as Sato et al. discloses that the foregoing element/compounds are suitable positive electrode active materials and can be selected as appropriate for the type of battery and other considerations. Thus, Sato et al. disclose the suitability of employing the specifically claimed additional element/compound in the positive electrode.

Claims 11, 17 and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kohno et al. (US 6,130,006) view of Shinyama et al. (US 2005/0019657).

The Examiner concludes that it would have been obvious to use the specific additional element/compound of positive electrode of Shinyama et al. in the positive electrode of Kohno et al. as Shinyama et al. discloses that the addition of W or W-based compound to the electrode prevents oxidation and degradation of the electrode material, and storage characteristics of the nickel-based battery are improved, and even in the storage under high temperature, decrease of capacity by self-discharge is declined, and cycle characteristics of the nickel-based battery are improved.

Claims 2-6 and 12-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over:  
a) Kohno et al. in view of Noda et al.; and/or b) Kohno et al. in view of Fleisher et al.; and/or c) Kohno et al. in view of Imoto et al.; and/or d) Kohno et al. in view of Sato et al.; and/or f) Kohno et al. in view of Shinyama et al. as applied to claims 1 and/or 11 above, and further in view of the Japanese publication JP 10-261412 (JP '412).

The Examiner concludes that it would have been obvious to use a cobalt compound coating on the nickel hydroxide of the positive electrode of the preceding prior art references as taught by the JP '412 because JP '412 discloses that positive electrodes including such a coating material is excellent in utilization factor of nickel hydroxide under atmosphere ranging from an ordinary temperature to a high temperature. Thus, the cobalt-based layer on the Ni-hydroxide electrode material complements a better utilization of that electrode material.

Applicants herein cancel claims 1-8 and 10. Applicants herein amend claim 11 to clarify the claims. Thereafter, Applicants respectfully disagree with the rejection because not all of the claimed limitations are taught or suggested by the cited combinations of references.

Applicants note that the secondary battery according to claim 11 is obtained following Steps (1) to (3) explained below.

Step (1): An additive is contained in the positive electrode.

Applicants note that this additive serves to increase the oxygen overvoltage of the positive electrode and thus to improve the short-time charging characteristic in a high-temperature atmosphere (see paragraphs [0030] and [0088] of the present application (U.S. Application Publication No. 2004/0209166 A1)).

Step (2): A hydrogen-absorbing alloy (rare-earth-Mg-Ni-based hydrogen-absorbing alloy) with the predetermined composition is contained in the negative electrode.

As a result of the improvement of the charging characteristic in high-temperature atmosphere achieved by Step (1), a problem arises in that the continuous charging life shortens because of the production of gamma nickel oxyhydroxide in the nickel hydroxide, which is a positive-electrode active material. This problem is solved by supplying the nickel hydroxide of the positive electrode with Mg eluted from the negative-electrode active material (rare-earth-Mg-Ni-based hydrogen-absorbing alloy) (paragraphs [0042] to [0047] and [0089]).

Applicants note that it has been confirmed that where an AB<sub>5</sub> type hydrogen-absorbing alloy is used as the negative-electrode active material as in Comparative Examples 1 and 2 described in the present application, the above problem remains unsolved. This is presumably because, while the rare-earth-Mg-Ni-based hydrogen-absorbing alloy used in the present invention as the negative-electrode active material contains Mg in a manner such that Mg replaces the rare-earth element (Ln), the AB<sub>5</sub> type hydrogen-absorbing alloy contains Mg in a manner such that Mg replaces the Ni atom.

Step (3): At least one of WO<sub>2</sub> and WO<sub>3</sub> is selected as an additive for the positive electrode.

By adding at least one of WO<sub>2</sub> and WO<sub>3</sub>, it is possible to most effectively solve the problem mentioned in Step (2) above, and at the same time to maintain the improved charging characteristic in high-temperature atmosphere, attained by Step (1) (see Table 1).

Applicants note that where MoO<sub>3</sub> is used as the positive-electrode additive as in Example 10, no improvement is observed with regard to the continuous charging life, etc. if the proportion of Mg is increased from 0.8 to 0.9. From this it can be concluded that the advantages of the present invention, such as improved continuous charging life, are achieved not solely by an increased amount of eluted Mg but by the synergetic effect of the addition of WO<sub>2</sub> and/or WO<sub>3</sub> and the eluted Mg.

Applicants note that Kohno et al. discloses a battery including a negative-electrode active material equivalent to the one used in the present invention. However, Kohno et al. does not take any notice of the problem that the short-time charging characteristic in high-temperature

atmosphere needs to be improved (Step (1)) or the problem that, because of the improved charging characteristic in high-temperature atmosphere, gamma nickel oxyhydroxide is produced in the nickel hydroxide, which is the positive-electrode active material, and deteriorates the continuous charging life (Step (2)). Therefore, one would not conceive, as a solution, of using a positive-electrode additive, in particular, of selecting  $\text{WO}_2$  and/or  $\text{WO}_3$  (Step (3)) from among a variety of possible positive-electrode additives.

Applicants note that Noda et al. discloses a solid-electrolyte cell in which an organic polymer is doped with an ionic compound. However, the cell of Noda et al. does not contain an alkaline electrolyte, which is indispensable for achieving the advantages of the present invention, namely, improved charging characteristic in high-temperature atmosphere and improved continuous charging life.

The additives disclosed in Noda et al. clearly do not provide the advantages of the present invention or have any connection with the completion of the present invention. Naturally, one would have found no reason to apply the teaching of Noda et al. to Kohno et al., which takes no notice of the problems mentioned in the present application.

Therefore, if Noda et al. is combined with Kohno et al., the combined teachings lack the aforementioned Step (3).

The Examiner asserts that the below-mentioned phenomenon (hereinafter "Phenomenon A") is known in the art. Incorporation of the foregoing additional element/compound in the positive electrode makes it possible to lower the rate at which the cobalt compound in the nickel hydroxide active material is dissolved and precipitated in the electrolytic solution. As a result,

the overall structure of the positive electrode is rendered denser, thereby preventing elements such as Mg constituting the hydrogen-absorbing alloy which have been eluted with the electrolytic solution after prolonged storage from penetrating into the positive electrode, making it possible to maintain a good conduction network.

However, the primary advantages of the present invention are achieved not by the above-noted Phenomenon A, but by actively supplying the nickel hydroxide of the positive electrode with Mg eluted from the negative-electrode active material, thereby restraining the production of gamma nickel oxyhydroxide in the nickel hydroxide as the positive-electrode active material.

Fleischer et al. discloses a cell using a non-liquid electrolyte. The cell of Fleischer et al. does not contain an alkaline electrolyte, which is indispensable for achieving the advantages of the present invention, namely, improved charging characteristic in high-temperature atmosphere and improved continuous charging life.

Applicants submit that the additives taught by Fleischer et al. clearly do not provide the advantages of the present invention or have any connection with the completion of the present invention. Therefore, Applicants submit that one would not have applied the teaching of Fleischer et al. to Kohno et al., which does not take any notice of the problems stated in the present application.

If Fleischer et al. is combined with Kohno et al., the combined teachings lack the aforementioned Step (3).

The Examiner reasserts that the aforementioned Phenomenon A is known in the art. As discussed above in relation to Noda et al., however, it is not Phenomenon A that achieves the

primary advantages of the present invention. Thus, Applicants respectfully disagree with the Examiner's argument.

With respect to Imoto et al., Applicants note that the positive-electrode additives disclosed in Imoto et al. are used with batteries that employ an AB<sub>5</sub> type hydrogen-absorbing alloy as the negative-electrode active material. However, the additives of Imoto et al. clearly do not provide the advantage set forth in Step (2) above, nor do they have any connection with the completion of the present invention. One would not have applied the teaching of Imoto et al. to Kohno et al., which takes no notice of the problems mentioned in the present application. If Imoto et al. is combined with Kohno et al., the combined teachings lack the aforementioned Step (3).

Further with reference to Imoto et al., the Examiner repeats that Phenomenon A is known in the art. However, as noted above in relation to Noda et al., it is not Phenomenon A that achieves the primary advantages of the present invention.

With respect to Sato et al., Applicants note that Sato et al. has an international publication date (Apr. 10, 2003) later than the priority date (Nov. 28, 2002) of the present application and thus is not an effective prior art reference in terms of § 102(e). Accordingly, the §103(a) rejection based on Sato et al. is considered unjustifiable.

Nevertheless, Applicants submit that Sato et al. discloses a battery using a nonaqueous electrolyte. The battery of Sato et al. does not contain an alkaline electrolyte, which is indispensable for achieving the advantages of the present invention, that is, improved charging characteristic in high-temperature atmosphere and improved continuous charging life.

Thus, the additives disclosed in Sato et al. clearly do not provide the advantages of the present invention or contribute to the completion of the present invention. Therefore, one would not have combined the teaching of Sato et al. with the teaching of Kohno et al., which does not take any notice of the problems set forth in the present application. If Sato et al. is combined with Kohno et al., the combined teachings lack the aforementioned Step (3).

The Examiner repeats that the aforementioned Phenomenon A is known in the art. However, as noted above in relation to Noda et al., it is not Phenomenon A that achieves the primary advantages of the present invention. Thus, Applicants respectfully disagree with the Examiner's argument.

With respect to Shinyama et al., Applicants note that Shinyama et al. has an international publication date (Jun. 19, 2003) later than the priority date (Nov. 28, 2002) of the present application and thus is not an effective prior art reference as provided by § 102(e). The § 103(a) rejection based on Shinyama et al. is therefore considered unjustifiable.

Nevertheless, Applicants note that Shinyama et al. discloses nothing but adding a compound of W or the like to the electrolyte or to the negative electrode (Table 3). The advantages of the present invention are achieved by adding the claimed additive(s) to the positive electrode. The compound of W or the like taught by Shinyama et al., which is not added to the positive electrode, clearly does not provide the advantages of the present invention or contribute to the completion of the present invention. Therefore, one would not have combined the teaching of Shinyama et al. with that of Kohno et al. which does not take any notice of the problems mentioned in the present application.

If Shinyama et al. is combined with Kohno et al., the combined teachings lack the aforementioned Step (3).

Also with reference to Shinyama et al., the Examiner repeats that the aforementioned Phenomenon A is known in the art. However, as noted above in relation to Noda et al., it is not Phenomenon A that achieves the primary advantages of the present invention. The Examiner's argument is therefore considered unjustified.

With respect to JP '412, Applicants note that JP '412 merely discloses adding additives other than the positive-electrode additive (WO<sub>2</sub>, WO<sub>3</sub>) used in the present invention to nickel hydroxide coated with a cobalt compound. The battery of the present invention is not obtained if JP'412 is combined with any of the above-discussed references.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Application No. 10/720,700  
Attorney Docket No. 032134

Amendment under 37 C.F.R. §1.111  
Amendment filed October 29, 2007

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

**WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP**



Kenneth H. Salen  
Attorney for Applicants  
Registration No. 43,077  
Telephone: (202) 822-1100  
Facsimile: (202) 822-1111

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